

[0099] We claim:

1. A peptide comprising the amino acid sequence of SEQ ID No: 1a.
2. A peptide comprising the amino acid sequence of SEQ ID No: 1a or a fragment thereof, wherein said fragment increases degree or rate of osteogenesis by BMP-2 in mammalian cells.
3. A peptide comprising the amino acid sequence of SEQ ID No: 1a or a fragment thereof, wherein said fragment increases degree or rate of calcification in vertebrate cells.
4. A peptide comprising the amino acid sequence of SEQ ID No: 1a or a fragment thereof, wherein said fragment increases degree or rate of calcification in mammalian chondrogenic and osteogenic precursor cells.
5. A composition comprising:
  - (a) a peptide comprising the amino acid sequence of SEQ ID No: 1a or a fragment thereof, wherein said fragment increases degree or rate of osteogenesis by BMP-2 in mammalian cells; and
  - (b) one of a TGF- $\beta$  family member.
6. A composition comprising:
  - (a) a peptide comprising the amino acid sequence of SEQ ID No: 1a or a fragment thereof, wherein said fragment increases degree or rate of osteogenesis by BMP-2 in mammalian cells; and
  - (b) one of BMP-2, BMP-4, BMP-7 or demineralized bone matrix.
7. A composition comprising:
  - (a) a peptide comprising the amino acid sequence of SEQ ID No: 1a or a fragment thereof, wherein said fragment increases degree or rate of osteogenesis by BMP-2 in mammalian cells; and
  - (b) one of a member molecules having sequence similarity to TGF- $\beta$ .

8. An isolated DNA encoding a functional peptide having the amino acid sequence of SEQ ID No: 1a.

9. A substantially pure nucleic acid sequence of SEQ. ID. No. 1b.

10. A nucleic acid construct comprising an expression vector operatively linked to a nucleic acid sequence encoding a peptide comprising the amino acid sequence of SEQ ID No: 1a or a fragment thereof, wherein said fragment increases degree or rate of osteogenesis by BMP-2 in mammalian cells.

11. A medicament for use in inducing the rate or degree of osteogenesis in a vertebrate including:

(a) a therapeutically effective dosage of a peptide comprising the amino acid sequence of SEQ ID No: 1a or a fragment thereof, wherein said fragment increases degree or rate of osteogenesis by BMP-2 in mammalian cells; and

(b) a therapeutically effective dosage of one of BMP-2 or demineralized bone matrix.

12. A medicament for use in inducing the rate or degree of calcification in a vertebrate including a peptide comprising the amino acid sequence of SEQ ID No: 1a or a fragment thereof, wherein said fragment increases degree or rate of calcification in vertebrate cells.

13. A medicament for use in inducing the rate or degree of calcification in a vertebrate including a peptide comprising the amino acid sequence of SEQ ID No: 1a or a fragment thereof, wherein said fragment increases degree or rate of calcification in mammalian chondrogenic and osteogenic precursor cells.

14. A method of detecting the ability of BBP to enhance the residency time of a TGF- $\beta$  homologous molecule comprising:

(a) applying an amount of the TGF- $\beta$  homologous molecule at a first and second selected location;

(b) applying a selected amount of BBP at the first selected location;

(c) detecting the amount of the TGF- $\beta$  homologous molecule at the first and second location after a selected time period; and

(d) calculating the difference between the amount of the TGF- $\beta$  homologous molecule at the first and second location.

15. The method of claim 14, wherein TGF- $\beta$  homologous molecule is one of: BMP-2, BMP-4, or BMP-7.

16. A method of enhancing the rate or degree of osteogenesis in vertebrate tissue, comprising applying to the tissue:

(a) a peptide comprising the amino acid sequence of SEQ ID No: 1a or a fragment thereof, wherein said fragment increases degree or rate of osteogenesis by BMP-2 in mammalian cells; and

(b) one of BMP-2 or demineralized bone matrix.

17. A method of inducing calcification of vertebrate tissue, comprising applying to the tissue a peptide comprising the amino acid sequence of SEQ ID No: 1a or a fragment thereof, wherein said fragment increases degree or rate of calcification in vertebrate cells.

18. A method of inducing calcification of mammalian osteogenic tissue, comprising applying to the tissue a peptide comprising the amino acid sequence of SEQ ID No: 1a or a fragment thereof, wherein said fragment increases degree or rate of calcification in mammalian chondrogenic and osteogenic precursor cells.

19. A method of enhancing the rate or degree of osteogenesis in vertebrate tissue, comprising:

(a) administering osteogenic cells to the patient at a location proximate to the desired location of osteogenesis;

(b) administering a peptide comprising the amino acid sequence of SEQ ID No: 1a or a fragment thereof, wherein said fragment increases degree or rate of osteogenesis by BMP-2 in mammalian cells; and

(c) administering one of BMP-2 or demineralized bone matrix.

20. A method of enhancing the rate or degree of calcification in vertebrate tissue, comprising:

(a) administering osteogenic cells to the patient at a location proximate to the desired location of calcification;

(b) administering a peptide comprising the amino acid sequence of SEQ ID No: 1a or a fragment thereof, wherein said fragment increases degree or rate of calcification in vertebrate chondrogenic and osteogenic precursor cells.

21. A method of enhancing the rate or degree of osteogenesis in a vertebrate, comprising:

(a) treating vertebrate mesenchymal stem cells with one of BMP-2 or demineralized bone matrix to induce osteogenesis of the cells;

(b) treating the vertebrate mesenchymal stem cells with a peptide comprising the amino acid sequence of SEQ ID No: 1a or a fragment thereof, wherein said fragment increases degree or rate of osteogenesis by BMP-2 in vertebrate cells; and

(c) administering the vertebrate mesenchymal stem cells to the patient at a location proximate to the desired location of osteogenesis.

22. An article of manufacture comprising a peptide immobilized on a solid support, wherein said peptide comprises the amino acid sequence of SEQ ID No: 1a or a fragment thereof, wherein said fragment increases degree or rate of osteogenesis by BMP-2 in mammalian cells.

23. The article of manufacture of claim 22 further including BMP-2 or demineralized bone matrix.

24. An article of manufacture comprising a peptide immobilized on a solid support, wherein said peptide comprises the amino acid sequence of SEQ ID No: 1a or a fragment thereof, wherein said fragment increases degree or rate of calcification in vertebrate cells.

25. An implant for use *in vivo* comprising, a substrate having a surface, wherein at least the surface of the implant includes a peptide comprising the amino acid sequence of SEQ ID No: 1a or a fragment thereof,

wherein said fragment increases degree or rate of osteogenesis by BMP-2 in mammalian cells; and one of BMP-2 or demineralized bone matrix

26. An implant for use *in vivo* comprising, a substrate having a surface, wherein at least the surface of the implant includes a peptide comprising the amino acid sequence of SEQ ID No: 1a or a fragment thereof, wherein said fragment increases degree or rate of calcification in vertebrate cells..

27. The implant of claim 26, wherein at least the surface of the implant includes at least one of chondrogenic or osteogenic precursor cells.

28. The implant of claim 25 or 26, wherein the substrate is formed into the shape of a pin, screw, plate, or prosthetic joint.

29. A nucleic acid construct comprising an expression vector operatively linked to a nucleic acid sequence encoding a peptide comprising the amino acid sequence of SEQ ID No: 1a or a fragment thereof, wherein said fragment increases degree or rate of calcification in vertebrate cells.

30. A nucleic acid construct comprising an expression vector operatively linked to a nucleic acid sequence encoding a peptide comprising the amino acid sequence of SEQ ID No: 1a or a fragment thereof, wherein said fragment increases degree or rate of calcification of mammalian chondrogenic and osteogenic precursor cells.

31. A transformant obtained by introducing the nucleic acid construct of claim 29 or 30 into a host cell.

32. An antibody having selective binding to any portion of a peptide comprising the amino acid sequence of SEQ ID No: 1a, 3 or 4.

33. An antibody to having selective binding to any portion of a peptide comprising the amino acid sequence of SEQ ID No: 1a, 3 or 4, and wherein said antibody decreases degree or rate of osteogenesis by BMP-2 in mammalian cells.

34. An antibody to having selective binding to any portion of a peptide comprising the amino acid sequence of SEQ ID No: 1a, 3 or 4, and wherein said antibody decreases degree or rate of calcification in vertebrate cells.

35. An antibody to having selective binding to any portion of a peptide comprising the amino acid sequence of SEQ ID No: 1a, 3 or 4, and wherein said antibody decreases degree or rate of calcification in mammalian chondrogenic and osteogenic precursor cells.

36. A method of detecting the presence of BBP in sample comprising:

(a) obtaining an antibody having selective binding to any portion of a peptide comprising the amino acid sequence of SEQ ID No: 1a, 3 or 4;

(b) exposing the sample to the antibody having selective binding to any portion of a peptide comprising the amino acid sequence of 1a, 3 or 4;

(c) visualizing the complex of a peptide comprising the amino acid sequence of SEQ ID No: 1a and antibody having selective binding to any portion of a peptide comprising the amino acid sequence of 1a, 3 or 4.

37. A method of detecting the presence of a nucleic acid encoding BBP in sample comprising:

(a) obtaining a nucleic acid complimentary to and having selective binding to any portion of a nucleic acid sequence of SEQ ID No: 1b;

(b) exposing the sample to the nucleic acid complimentary to and having selective binding to any portion of a nucleic acid sequence of SEQ ID No: 1b;

(c) visualizing the complex of the nucleic acid encoding BBP and an nucleic acid complimentary to and having selective binding to any portion of a nucleic acid sequence of SEQ ID No: 1b.